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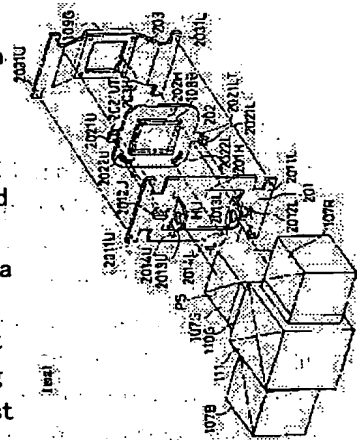
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(54) PROJECTION TYPE DISPLAY DEVICE AND OPTICAL BLOCK FOR PROJECTION TYPE DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To fix a reflection type light valve to a polarization beam splitter.

SOLUTION: A 1st united member 201 is stuck to the polarization beam splitter 107G with direct fitting members 2013U and 2013L while the top and reverse surfaces of the polarization beam splitter 107G through which light does not pass are sandwiched by filling adhesive in through holes (opening) HU and HL. A 1/4-wavelength phase plate united member 202 to which a 1/4-wavelength phase plate 108G is stuck has a holding part 2021U inserted into a through hole 2012U of the 1st united member 201 and a holding part 2021L inserted into a through hole part 2012L respectively. A light valve united member 203 fitted with the light valve 109G has the tips of solder fitting parts 2031U and 2031L soldered to soldering fitting parts 2011U and 2011L of the 1st united member 201 respectively.



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CLAIMS

[Claim(s)]

[Claim 1] The light source which supplies the illumination light, and the light valve which modulates and injects the light by which incidence is carried out from said light source based on a picture signal, The incident light study system which projects the image of said light valve, and the light valve installation optical member in which said light valve is attached, It is pasted up and attached in the field which does not pass the light of said light valve installation optical member. the projection mold display characterized by having the fixing member which fixes said light valve installation optical member and said light valve so that the stress to said light valve installation optical member produced by ambient-temperature change after adhesion may become point symmetry.

[Claim 2] The projection mold indicating equipment characterized by forming opening of a point symmetry configuration in jointing with said light valve installation optical member in a projection mold indicating equipment according to claim 1 at said fixing member.

[Claim 3] It is the projection mold indicating equipment characterized by pasting up with said light valve installation optical member with the adhesives with which it filled up with said fixing member into said opening in the projection mold indicating equipment according to claim 2.

[Claim 4] Said light valve installation optical member and said fixing member are a projection mold indicating equipment characterized by pasting up through the adhesives applied to said adhesives spreading section including the adhesives spreading section which is the field where said fixing member meets said light valve installation optical member in a projection mold indicating equipment according to claim 2 and by which adhesives are applied to the perimeter around said opening.

[Claim 5] The polarization separation optical system which carries out polarization separation of the illumination light injected from said light source in a projection mold display according to claim 1 at a specific polarization component, and is injected to said light valve, It has further the analyzing light study system which analyzes light a specific polarization component from the light which injected said light valve, and is injected to said incident light study system. Said polarization separation optical system, said analyzing light study system, and said light valve installation optical member The 1st prism, The polarization beam splitter constituted by the polarization demarcation membrane which is arranged between the 2nd prism, and said 1st prism and said 2nd prism, and carries out polarization separation of the incident light is included in common. Said fixing member is a projection mold display characterized by being pasted up and attached in the field which does not pass the light of one prism of said 1st prism and said 2nd prism.

[Claim 6] The color-separation optical system which separates the color of the light from said light source side, and is injected to said light valve side in a projection mold indicating equipment according to claim 1, It consists of two or more prism, color composition of the light from said light valve side is carried out, and it has further the color composition optical system injected to said incident light study system side. Said light valve and said fixing member It is the projection mold display which is arranged for each [color composition is carried out by said color composition optical system] color of every, and is characterized by pasting up and attaching said fixing member in the field which does not pass the light of any one prism of two or more prism which constitutes said color composition optical system, respectively.

[Claim 7] The light valve installation optical member in which the light valve which modulates and injects the light from the light source based on a picture signal is attached, It is pasted up and attached in the field which does not pass the light of said light valve installation optical member. the optical block for projection mold indicating equipments characterized by having the fixing member which fixes said light valve installation optical member and said light valve so that the stress to said light valve installation optical member produced by ambient-temperature

change after adhesion may become point symmetry.

[Claim 8] The optical block for projection mold indicating equipments characterized by forming opening of a point symmetry configuration in jointing with said light valve installation optical member at said fixing member in the optical block for projection mold indicating equipments according to claim 7.

[Claim 9] It is the optical block for projection mold indicating equipments characterized by pasting up with said light valve installation optical member with the adhesives with which it filled up with said fixing member into said opening in the optical block for projection mold indicating equipments according to claim 8.

[Claim 10] Said light-valve installation optical member and said fixing member are an optical block for projection mold indicating equipments characterized by to paste up through the adhesives applied to said adhesives spreading section including the adhesives spreading section which is the field where said fixing member meets said light-valve installation optical member in the optical block for projection mold indicating equipments according to claim 8 and by which adhesives are applied to the perimeter around said opening.

[Claim 11] The polarization separation optical system which carries out polarization separation of the illumination light injected from said light source at a specific polarization component in the optical block for projection mold indicating equipments according to claim 7, and is injected to said light valve, It has further the analyzing light study system which analyzes light a specific polarization component from the light which injected said light valve, and is injected to said incident light study system. Said polarization separation optical system, said analyzing light study system, and said light valve installation optical member The 1st prism, The polarization beam splitter constituted by the polarization demarcation membrane which is arranged between the 2nd prism, and said 1st prism and said 2nd prism, and carries out polarization separation of the incident light is included in common. Said fixing member is an optical block for projection mold indicating equipments characterized by being pasted up and attached in the field which does not pass the light of one prism of said 1st prism and said 2nd prism.

[Claim 12] The color-separation optical system which separates the color of the light from said light source side, and is injected to said light valve side in the optical block for projection mold indicating equipments according to claim 7, It consists of two or more prism, and has further the color composition optical system which carries out color composition of the light from said light valve side. Said light valve and said fixing member It is the optical block for projection mold indicating equipments which is arranged for each [color composition is carried out by said color composition optical system] color of every, and is characterized by pasting up and attaching said fixing member in the field which does not pass the light of any one prism of two or more prism which constitutes said color composition optical system, respectively.

[Claim 13] The light source which supplies the illumination light, and the light valve which modulates and injects the light by which incidence is carried out from said light source based on a picture signal, The incident light study system which projects the image of said light valve, and the light valve installation optical member in which said light valve is attached, It is pasted up and attached in the field which does not pass the light of said light valve installation optical member. It has the fixing member which fixes said light valve installation optical member and said light valve. Said fixing member It is the projection mold display which opening is formed in jointing with said light valve installation optical member, and is characterized by having pasted up said light valve installation optical member and said fixing member through the adhesives with which said opening was filled up.

[Claim 14] The light source which supplies the illumination light, and the light valve which modulates and injects the light by which incidence is carried out from said light source based on a picture signal, The incident light study system which projects the image of said light valve, and the light valve installation optical member in which said light valve is attached, It is pasted up and attached in the field which does not pass the light of said light valve installation optical member. It has the fixing member which fixes said light valve installation optical member and said light valve. Said fixing member Are the field which meets said light valve installation optical member, and the adhesives spreading section by which adhesives are applied to the perimeter around opening formed in jointing with said light valve installation optical member is included. Said light valve installation optical member and said fixing member are a projection mold display characterized by having pasted up through the adhesives applied to said adhesives spreading section.

[Claim 15] The light valve installation optical member in which the light valve which modulates and injects the light from the light source based on a picture signal is attached, It is pasted up and attached in the field which does not pass the light of said light valve installation optical member. It has the fixing member which fixes said light

valve installation optical member and said light valve. Said fixing member It is the optical block for projection mold indicating equipments which opening is formed in jointing with said light valve installation optical member, and is characterized by having pasted up said light valve installation optical member and said fixing member through the adhesives with which said opening was filled up.

[Claim 16] The light valve installation optical member in which the light valve which modulates and injects the light from the light source based on a picture signal is attached, It is pasted up and attached in the field which does not pass the light of said light valve installation optical member. It has the fixing member which fixes said light valve installation optical member and said light valve. Said fixing member Are the field which meets said light valve installation optical member, and the adhesives spreading section by which adhesives are applied to the perimeter around opening formed in jointing with said light valve installation optical member is included. Said light valve installation optical member and said fixing member are an optical block for projection mold indicating equipments characterized by having pasted up through the adhesives applied to said adhesives spreading section.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a projection mold display.

[0002]

[Description of the Prior Art] The projection mold display using a reflective mold light valve is known. In this projection mold indicating equipment, incidence of the light which carried out outgoing radiation of the polarization beam splitter is carried out to a light valve through direct or prism. The light by which reflective injection was carried out with the light valve goes to incident light and an opposite direction, and is again led to a polarization beam splitter.

[0003] With the equipment mentioned above, the optical member and light valve which carry out outgoing radiation of the light to a light valve fix directly. A reflective mold light valve and the 2nd metal member paste up conventional equipment while for example, an optical member and the 1st metal member paste up. And the optical member and the reflective mold light valve were unified by soldering the metal member of these 1st, and the 2nd metal member.

[0004]

[Problem(s) to be Solved by the Invention] If the physical relationship of an optical member and a reflective mold light valve shifts, the so-called pixel gap will arise and the image quality of a projection image will deteriorate. Then, if the adhesives which become hard by the hardening back are used in order to paste up the above-mentioned optical member and the 1st metal member, the unnecessary force will occur in jointing by the difference in the coefficient of thermal expansion of an optical member and adhesives. Consequently, jointing broke away and there was a possibility that jointing of an optical member might be damaged.

[0005] The purpose of this invention is to offer the projection mold indicating equipment which prevents that jointing between the fixing members and light valve installation optical members to which thermal-expansion contraction of adhesives is the cause and fixes a light valve exfoliates, or that a light valve installation optical member is damaged, and its optical block.

[0006]

[Means for Solving the Problem] It matches with drawing 1 which shows the gestalt of 1 operation, drawing 2 , drawing 3 , drawing 4 , and drawing 5 , and this invention is explained.

(1) The projection mold display by invention according to claim 1 The light source 101 which supplies the illumination light, and light valve 109G (109B) which modulate and inject the light by which incidence is carried out from the light source 101 based on a picture signal (109R), The incident light study system 112 which projects the image of light valve 109G (109R) (109B), Light valve installation optical member 107G (107B) in which light valve 109G (109R) (109B) are attached (107R), It is pasted up and attached in the field which does not pass the light of light valve installation optical member 107G (107R) (107B). so that the stress to light valve installation optical member 107G (107R) (107B) produced by ambient-temperature change after adhesion may become point symmetry The purpose mentioned above is attained by having the fixing member 201 which fixes light valve installation optical member 107G (107R) (107B) and light valve 109G (109R) (109B).

(2) Invention according to claim 2 is characterized by forming the openings HU and HL of a point symmetry configuration in jointing of light valve installation optical member 107G (107R) (107B) in a projection mold indicating equipment according to claim 1 at the fixing member 201.

(3) Invention according to claim 3 is characterized by pasting up the fixing member 201 with the adhesives with which it filled up into Openings HU and HL with light valve installation optical member 107G (107R) (107B) in a projection mold display according to claim 2.

Invention according to claim 4 is set to a projection mold display according to claim 2. (4) The fixing member 201 It is the field which meets light valve installation optical member 107G (107R) (107B). To the perimeter around Openings HU and HL Light valve installation optical member 107G (107R) (107B) and the fixing member 201 are characterized by pasting up through the adhesives applied to the adhesives spreading section including the adhesives spreading section to which adhesives are applied.

(5) Set invention according to claim 5 to a projection mold display according to claim 1. The polarization separation optical system which carries out polarization separation of the illumination light injected from the light source 101 at a specific polarization component, and is injected to light valve 109G (109R) (109B), It has further the analyzing light study system which analyzes light a specific polarization component from the light which injected light valve 109G (109R) (109B), and is injected to the incident light study system 112. Polarization separation optical system, an analyzing light study system, and a light valve installation optical member Polarization beam splitter 107G constituted by the polarization demarcation membrane PS which is arranged between 1st prism 107GA, 2nd prism 107GB, and 1st prism 107GA and 2nd prism 107GB, and carries out polarization separation of the incident light are included in common. The fixing member 201 It is characterized by being pasted up and attached in the field which does not pass the light of one prism (1st prism 107GA and 2nd prism 107GB).

(6) Set invention according to claim 6 to a projection mold display according to claim 1. The color-separation optical system 303, 304, and 305 which separates the color of the light from a light source 301 side, and is injected to the light valve 307B (307R) (307G) side, Consist of two or more prism and color composition of the light from the light valve 307B (307R) (307G) side is carried out. It has further the color composition optical system 303, 304, and 305 injected to the incident light study system 308 side. Light valve 307B (307R) (307G) and the fixing member 201 It is arranged for each [color composition is carried out by the color composition optical system 303, 304, and 305] color of every, and is characterized by being pasted up and attached in the field where the fixing member 201 does not pass the light of any one prism of two or more prism which constitutes the color composition optical system 303, 304, and 305, respectively.

(7) The optical block for projection mold indicating equipments by invention according to claim 7 Light valve installation optical member 107G (107B) in which light valve 109G (109R) (109B) which modulate and inject the light from the light source 101 based on a picture signal are attached (107R), It is pasted up and attached in the field which does not pass the light of light valve installation optical member 107G (107R) (107B). so that the stress to light valve installation optical member 107G (107R) (107B) produced by ambient-temperature change after adhesion may become point symmetry The purpose mentioned above is attained by having the fixing member 201 which fixes light valve installation optical member 107G (107R) (107B) and light valve 109G (109R) (109B).

(8) Invention according to claim 8 is characterized by forming the openings HU and HL of a point symmetry configuration in jointing of light valve installation optical member 107G (107R) (107B) at the fixing member 201 in the optical block for projection mold indicating equipments according to claim 7.

(9) Invention according to claim 9 is characterized by pasting up the fixing member 201 with the adhesives with which it filled up into Openings HU and HL with light valve installation optical member 107G (107R) (107B) in the optical block for projection mold indicating equipments according to claim 8.

Invention according to claim 10 is set to the optical block for projection mold indicating equipments according to claim 8. (10) The fixing member 201 It is the field which meets light valve installation optical member 107G (107R) (107B). To the perimeter around Openings HU and HL Light valve installation optical member 107G (107R) (107B) and the fixing member 201 are characterized by pasting up through the adhesives applied to the adhesives spreading section including the adhesives spreading section to which adhesives are applied.

(11) Set invention according to claim 11 to the optical block for projection mold indicating equipments according to claim 7. The polarization separation optical system which carries out polarization separation of the illumination light injected from the light source 101 at a specific polarization component, and is injected to light valve 109G (109R) (109B), It has further the analyzing light study system which analyzes light a specific polarization component from the light which injected light valve 109G (109R) (109B), and is injected to the incident light study system 112. Polarization separation optical system, an analyzing light study system, and a light valve installation optical member Polarization beam splitter 107G constituted by the polarization demarcation membrane PS which is arranged between 1st prism 107GA, 2nd prism 107GB, and 1st prism 107GA and 2nd prism 107GB, and carries out polarization separation of the incident light are included in common. The fixing member 201 It is characterized by being pasted up and attached in the field which does not pass the light of one prism (1st prism 107GA and 2nd prism 107GB).

(12) Set invention according to claim 12 to the optical block for projection mold indicating equipments according to claim 7. The color-separation optical system 303, 304, and 305 which separates the color of the light from a light source 301 side, and is injected to the light valve 307B (307R) (307G) side, Consist of two or more prism and it has further the color composition optical system 303, 304, and 305 which carries out color composition of the light from the light valve 307B (307R) (307G) side. Light valve 307B (307R) (307G) and the fixing member 201 It is arranged for each [color composition is carried out by the color composition optical system 303, 304, and 305] color of every, and is characterized by being pasted up and attached in the field where the fixing member 201 does not pass the light of any one prism of two or more prism which constitutes the color composition optical system 303, 304, and 305, respectively.

(13) The projection mold display by invention according to claim 13. The light source 101 which supplies the illumination light, and light valve 109G (109B) which modulate and inject the light by which incidence is carried out from the light source 101 based on a picture signal (109R), The incident light study system 112 which projects the image of light valve 109G (109R) (109B), Light valve installation optical member 107G (107B) in which light valve 109G (109R) (109B) are attached (107R), It is pasted up and attached in the field which does not pass the light of light valve installation optical member 107G (107R) (107B). It has the fixing member 201 which fixes light valve installation optical member 107G (107R) (107B) and light valve 109G (109R) (109B). The fixing member 201 Openings HU and HL are formed in jointing of light valve installation optical member 107G (107R) (107B). The purpose mentioned above is attained by having pasted up light valve installation optical member 107G (107R) (107B) and the fixing member 201 through the adhesives with which Openings HU and HL were filled up.

(14) The projection mold display by invention according to claim 14 The light source 101 which supplies the illumination light, and light valve 109G (109B) which modulate and inject the light by which incidence is carried out from the light source 101 based on a picture signal (109R), The incident light study system 112 which projects the image of light valve 109G (109R) (109B), Light valve installation optical member 107G (107B) in which light valve 109G (109R) (109B) are attached (107R), It is pasted up and attached in the field which does not pass the light of light valve installation optical member 107G (107R) (107B). It has the fixing member 201 which fixes light valve installation optical member 107G (107R) (107B) and light valve 109G (109R) (109B). The fixing member 201 It is the field which meets light valve installation optical member 107G (107R) (107B). The adhesives spreading section by which adhesives are applied to the perimeter around the openings HU and HL formed in jointing of light valve installation optical member 107G (107R) (107B) is included. The purpose mentioned above is attained by having

pasted up light valve installation optical member 107G (107R) (107B) and the fixing member 201 through the adhesives applied to the adhesives spreading section.

(15) The optical block for projection mold indicating equipments by invention according to claim 15 Light valve installation optical member 107G (107B) in which light valve 109G (109R) (109B) which modulate and inject the light from the light source 101 based on a picture signal are attached (107R), It is pasted up and attached in the field which does not pass the light of light valve installation optical member 107G (107R) (107B). It has the fixing member 201 which fixes light valve installation optical member 107G (107R) (107B) and light valve 109G (109R) (109B). The fixing member 201 Openings HU and HL are formed in jointing of light valve installation optical member 107G (107R) (107B). The purpose mentioned above is attained by having pasted up light valve installation optical member 107G (107R) (107B) and the fixing member 201 through the adhesives with which Openings HU and HL were filled up.

(16) The optical block for projection mold indicating equipments by invention according to claim 16 Light valve installation optical member 107G (107B) in which light valve 109G (109R) (109B) which modulate and inject the light from the light source 101 based on a picture signal are attached (107R), It is pasted up and attached in the field which does not pass the light of light valve installation optical member 107G (107R) (107B). It has the fixing member 201 which fixes light valve installation optical member 107G (107R) (107B) and light valve 109G (109R) (109B). The fixing member 201 It is the field which meets light valve installation optical member 107G (107R) (107B). The adhesives spreading section by which adhesives are applied to the perimeter around the openings HU and HL formed in jointing of light valve installation optical member 107G (107R) (107B) is included. The purpose mentioned above is attained by having pasted up light valve installation optical member 107G (107R) (107B) and the fixing member 201 through the adhesives applied to the adhesives spreading section.

[0007] In addition, although it matched with drawing of the gestalt of operation by the term of above-mentioned The means for solving a technical problem in order to explain this invention plainly, thereby, this invention is not limited to the gestalt of operation.

[0008]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.

- Gestalt- drawing 1 of the first operation is the basic block diagram of the projection mold display by the gestalt of operation of the first of this invention. In drawing 1 a projection mold display The light source 101 and the cross dichroic mirror 102, The bending mirrors 103 and 104 and a dichroic mirror 105, field lens 106R for R light, and the object for G light — with field lens 106G Field lens 106B for B light, and polarization beam splitter 107R for R light, the object for G light — with polarization beam splitter 107G and polarization beam splitter 107B for B light Quarter-wave length phase plate 108R, quarter-wave length phase plate 108G, and quarter-wave length phase plate 108B, reflective mold light valve 109R for R light, and the object for G light — it has reflective mold light valve 109G, reflective mold light valve 109B for B light, the optical-path-length amendment members 110R, 110G, and 110B, the cross dichroic prism 111, and a projector lens 112.

[0009] The light source 101 consists of lamp 101a and concave mirror 101b of a paraboloid configuration. Incidence of the light source light of the abbreviation parallel flux of light injected from the light source 101 is carried out to the cross dichroic mirror 102. The cross dichroic mirror 102 consists of dichroic mirror 102B and dichroic mirror 102RG. Dichroic mirror 102B and dichroic mirror 102RG have 45 degrees whenever [incident angle] to an incident light shaft, respectively, and are arranged at the cross configuration. Dichroic mirror 102B has B (blue) light reflex property. On the other hand, dichroic mirror 102RG has R (red) light and G (green) light reflex property. The cross dichroic mirror 102 separates the color of the light source light by which incidence was carried out into B light which is perpendicular to an incident light shaft and advances to an opposite direction mutually, and a mixed light of R light and G light.

[0010] It is reflected by the bending mirror 103 and incidence of the B light whose color was separated is carried out to polarization beam splitter 107B for B light through field lens 106B for B light. It is reflected by the bending mirror 104 and incidence of the mixed light of R light and G light is carried out to a dichroic mirror 105. A dichroic mirror 105 is arranged so that 45 degrees may be made to an optical axis, and it has the property which penetrates R light while it reflects G light. A dichroic mirror 105 separates the color of a mixed light by which incidence was carried out into G light which progresses in the direction which intersects perpendicularly to an

incident light shaft, and R light which progresses in the same direction as an incident light shaft. Thus, the cross dichroic mirror 102 and a dichroic mirror 105 constitute the color-separation optical system which separates the color of light source light into the three primary colors of the light which consists of R light, G light, and B light. [0011] Incidence of the R light whose color was separated is carried out to polarization beam splitter 107R for R light through field lens 106R for R light. moreover, G light whose color was separated — the object for G light — pass field lens 106G — the object for G light — incidence is carried out to polarization beam splitter 107G. Polarization separation of each colored light by which incidence was carried out to the polarization beam splitter for each colored light, respectively is carried out at S polarization which reflects the polarization separation section and injects a polarization beam splitter, and P polarization which penetrates the polarization separation section and injects a polarization beam splitter. With the gestalt of the first operation, it is used as illumination light which turns S polarization to a light valve and injects it, and considers as the configuration which discards P polarization as an unnecessary light.

[0012] Incidence of the S polarization of R color which injected polarization beam splitter 107R for R light is carried out to reflective mold light valve 109R through quarter-wave length phase plate 108R. the object for G light — S polarization of G color which injected polarization beam splitter 107G should pass quarter-wave length phase plate 108G — incidence is carried out to reflective mold light valve 109G. Incidence of the S polarization of B color which injected polarization beam splitter 107B for B light is carried out to reflective mold light valve 109B through quarter-wave length phase plate 108B.

[0013] Here, the reflective mold light valves 109R, 109G, and 109B are explained. A reflective mold light valve is a write-in [electric] formula reflective mold light valve. That is, it is prepared so that nonlinear switching elements, such as TFT, may correspond to two or more pixels on a silicon substrate, respectively, and according to a picture signal, an electrical potential difference is alternatively impressed to the liquid crystal layer which constitutes the pixel of these TFT. The liquid crystal layer to which the electrical potential difference was impressed changes the array of a liquid crystal molecule, and the liquid crystal layer concerned comes to achieve the duty of a phase plate. Therefore, the polarization light by which incidence was carried out to the reflective mold light valve is led to a reflecting layer via the liquid crystal layer concerned, and the polarization by which incidence was carried out, and the polarization from which the oscillating direction differs are injected as a modulation light by reflecting by the reflecting layer and making it inject from a reflective mold light valve. The polarization by which incidence was carried out to TFT to which the part corresponding to the pixel of not choosing [of a reflective mold light valve], i.e., an electrical potential difference, is not impressed on the other hand advances according to the torsion structure of the orientation in early stages of a liquid crystal molecule, and is reflected in a reflecting layer. From going on conversely according to torsion structure again, this reflected light is injected as the polarization by which incidence was carried out, and the polarization with the same oscillating direction. Thus, the reflective injection light of a reflective mold light valve is a mixed light which consists of P polarization which is modulation light, and S polarization which is a light non-becoming irregular.

[0014] Incidence of the R colored light which carried out reflective injection of the light valve 109R for R colored light is again carried out to polarization beam splitter 107R through quarter-wave length phase plate 108R, and polarization separation is carried out at the modulation light of P polarization which penetrates the polarization separation section, and a light of S polarization which reflects the polarization separation section non-becoming irregular. A light reflected by polarization beam splitter 107R non-becoming irregular advances in the light source 101 direction, and is discarded. Similarly, incidence of the G colored light which carried out reflective injection of light valve 109G for G colored light is again carried out to polarization beam splitter 107G through quarter-wave length phase plate 108G, and polarization separation is carried out at the modulation light of P polarization which penetrates the polarization separation section, and a light of S polarization which reflects the polarization separation section non-becoming irregular. Moreover, incidence of the B colored light which carried out reflective injection of the light valve 109B for B colored light is again carried out to polarization beam splitter 107B through quarter-wave length phase plate 108B, and polarization separation is carried out at the modulation light of P polarization which penetrates the polarization separation section, and a light of S polarization which reflects the polarization separation section non-becoming irregular. Thereby, a light of each color non-becoming irregular advances in the light source 101 direction, and is discarded.

[0015] Quarter-wave length phase plate 108R, quarter-wave length phase plate 108G, and quarter-wave length

phase plate 108B is explained. A quarter-wave length phase plate changes the oscillating direction of polarization in the optimal direction according to the polarization separation property of a polarization beam splitter. Therefore, black does not come floating whitely. That is, contrast improves.

[0016] A quarter-wave length phase plate rotates the quarter-wave length phase plate concerned around an optical axis so that the reflective S polarization (light non-becoming irregular) by which reflective injection is carried out from a reflective mold light valve may be altogether reflected in the polarization separation section of a polarization beam splitter, and the location is adjusted. Actual adjustment gives the picture signal which projects a black image to a reflective mold light valve (a switching element is changed into the condition of not choosing, corresponding to all pixels), and it rotates a quarter-wave length phase plate so that the contrast of the condition whose black of No. 1 of a projection image is depressed, i.e., a projection image, can take high No. 1. When the contrast of a projection image becomes best, the oscillating direction of the reflective S polarization by which reflective injection is carried out turns into the optimal direction for the polarization separation section of a polarization beam splitter from a reflective mold light valve.

[0017] In addition, in the above-mentioned explanation, it is considered as the configuration which arranges a quarter-wave length phase plate between a reflective mold light valve and a polarization beam splitter. This configuration can be applied, when the reflective mold light valve to be used can regard it as an ideal mirror, or when the amendment for a pre tilt of the liquid crystal molecule in the liquid crystal layer of a light valve can amend by rotation of a quarter-wave length phase plate. Depending on the liquid crystal used for a light valve, contrast of a projection image may be unable to be adjusted the optimal using a quarter-wave length phase plate. In that case, what is necessary is to use a different wavelength phase plate from quarter-wave length instead of a quarter-wave length phase plate, to adjust and just to fix so that the wavelength phase plate concerned may be rotated around an optical axis and contrast may become the highest.

[0018] Incidence of P polarization which penetrated polarization beam splitter 107R for R colored light (modulation light), i.e., the analyzing light, is carried out to the cross dichroic prism 111 through optical-path-length amendment member 110R arranged between the injection side of polarization beam splitter 107R for R colored light, and the cross dichroic prism 111. Incidence of P polarization which penetrated polarization beam splitter 107G for G colored light (modulation light), i.e., the analyzing light, is carried out to the cross dichroic prism 111 through optical-path-length amendment member 110G arranged between polarization beam splitter 107 the injection sides of G and the cross dichroic prisms 111 for G colored light. Moreover, incidence of P polarization which penetrated polarization beam splitter 107B for B colored light (modulation light), i.e., the analyzing light, is carried out to the cross dichroic prism 111 through optical-path-length amendment member 110B arranged between the injection side of polarization beam splitter 107B for B colored light, and the cross dichroic prism 111.

[0019] Optical-path-length amendment member 110R, optical-path-length amendment member 110G, and optical-path-length amendment member 110B bear the duty which unifies the cross dichroic prism 111 and each polarization beam splitter for colored light while making the same the optical path length from each light valve for colored light to a projector lens 112.

[0020] The cross dichroic prism 111 is a compound prism member arranged so that the interior and R light reflex die clo IKKU film 111R and B light reflex die clo IKKU film 111B may cross at right angles mutually. The analyzing light of R color which carried out incidence to the cross dichroic prism 111 is reflected in a projector lens 112 side by R light reflex die clo IKKU film 111R. Moreover, the analyzing light of B color which carried out incidence to the cross dichroic prism 111 is reflected in a projector lens 112 side by B light reflex die clo IKKU film 111B. Furthermore, the analyzing light of G color which carried out incidence to the cross dichroic prism 111 penetrates both the die clo IKKU film 111R and 111B, and progresses to a projector lens 112 side. Thereby, the analyzing light of R color, G color, and B color is injected as a light by which color composition was carried out from the same side of the cross dichroic prism 111. Incidence of the color composition light is carried out to a projector lens 112, and it is projected on a full color image on a non-illustrated screen. Thus, the cross dichroic prism 111 constitutes color composition optical system.

[0021] A projector lens 112 is explained. A projector lens 112 has non-illustrated an aperture diaphragm, a pre-group lens, and a back group lens in the interior. A pre-group lens is arranged in the cross dichroic prism 111 side (it sets to drawing 1 and is right-hand side) from an aperture diaphragm. an aperture diaphragm arranges a projector lens 112 in the location of the focal distance of a pre-group lens — having — the so-called before side

— a tele cent — it has a rucksack configuration. A chief ray is defined as a beam of light passing through the center section of the aperture diaphragm of a projector lens 12, and if a projector lens 12 is gone back and this chief ray is followed, a chief ray will progress as follows. They are the projector lens 12 → cross dichroic prism 111, each chromatic polarization beam splitters 107R and 107G, 107B → each color quarter-wave length phase plates 108R and 108G, 108B → each color light valves 109R and 109G, 109B → each color quarter-wave length phase plates 108R, 108G, and 108B, → each chromatic polarization beam splitters 107R, 107G, and 107B, and each color field lenses 106R, 106G, and 106B. being parallel to an optical axis in the above optical path — becoming — an optical axis — receiving — a tele cent — it has rucksack composition.

[0022] With each color field lenses 106R, 106G, and 106B, the chief ray of each color bent, respectively advances the color-separation optical system 102,105, and is condensed by lamp 101a of the light source 101. Thus, the field lenses 106R, 106G, and 106B collateralize the tele cent rucksack nature of the chief ray of the optical path between field lenses and projector lenses 12 concerned. Therefore, although the polarization separation property of a polarization beam splitter, the phase separation property of a quarter-wave length phase plate, the modulation characteristic of the modulation layer of a light valve, and the optical property of the die clo IKKU film in a cross dichroic prism have property change for which it depended on whenever [incident angle / of an incident ray], respectively, since they are altogether used as the optical axis about the chief ray at parallel, reduction of the contrast in a projection image and generating of color shading are suppressed.

[0023] the projection mold indicating equipment of the configuration of drawing 1 which explained this invention above — it is and has the description about unification of optical members, such as a reflective mold light valve for each colored light, a quarter-wave length phase plate, and a polarization beam splitter. Drawing 2 is a decomposition block diagram explaining installation of the polarization beam splitter of the projection mold indicating equipment of drawing 1, a quarter-wave length phase plate, and a light valve. In drawing 2, the same sign is described in the same member as drawing 1. the polarization beam splitter which fixes to the cross dichroic prism 111 here — the object for G light — there are three, polarization beam splitter 107G and polarization beam splitter 107for R light R and polarization beam splitter 107B for B light. Although each quarter-wave length phase plate for colors and each reflective mold light valve for colors are attached in each polarization beam splitter, respectively, 3 sets of the mounting arrangement are the same. then — as a representative — the object for G colored light — installation with quarter-wave length phase plate 108G to polarization beam splitter 107G and reflective mold light valve 109G is explained, and the illustration about installation of R color and each part material for B colors and explanation are omitted.

[0024] The 1st unification member 201 is attached in polarization beam splitter 107G in drawing 2. The 1st unification member 201 has a frame configuration. That is, abbreviation rectangle-like H [opening 201] which pass the incident light of light valve 109G and the reflective injection light from light valve 109G are prepared in the center section. It is installed in each of the upper part of opening 201H, and the lower part by the lower part toward the lower part of opening 201H to the upper part, respectively from the upper part of opening 201H, and the bending sections 2013U (upper part) and 2013L (lower part) bent at the polarization beam splitter 107 side are formed in it. These bending sections 2013U and 2013L are the direct installation sections directly pasted up on polarization beam splitter 107G. The through holes HU and HL of polarization beam splitter 107G used as an adhesives reservoir in the case of adhesion are formed in these direct installation sections 2013U and 2013L, respectively.

[0025] In order to attach the quarter-wave length phase plate attaching member 202 mentioned later, the through hole sections 2012U and 2012L are formed in the upper part of the 1st unification member 201, and a lower abbreviation center section. One side of a through hole section 2012U top and one side of the through hole section 2012L bottom are made into the radii configuration so that the quarter-wave length phase plate attaching member 202 can be rotated.

[0026] In the 1st unification member 201, the soldering installation sections 2011U and 2011L installed up and down, respectively are formed in a through hole section 2012U top and the through hole section 2012L bottom. Soldering fixing of the light valve unification member 203 mentioned later is carried out to these soldering installation sections 2011U and 2011L.

[0027] In one side of the right-and-left section of opening 201H, the projection boss sections 2014U and 2014L are further formed in the bending direction and opposite direction of direct installation section 2013U and 2013L

at the 1st unification member 201. These projection boss sections 2014U and 2014L are inserted in the through hole of rotation location ***** currently formed in the quarter-wave length phase plate unification member 202 mentioned later.

[0028] The 1st unification member 201 explained above is with the direct installation sections 2013U and 2013L bent at the polarization beam splitter 107G side, and adhesion fixing is carried out so that the vertical side through which the light of polarization beam splitter 107G does not pass may be put. Drawing 3 (a) is the perspective view showing signs that the 1st unification member 201 is attached in polarization beam splitter 107G. The part which approaches injection and the field which carries out incidence in G light of the vertical side through which the light of polarization beam splitter 107G does not pass is made to put between the direct installation sections 2013U and 2013L (un-illustrating). Through holes (opening) HU and HL (un-illustrating) are made to fill up with and harden adhesives in this condition, and the 1st unification member 201 and polarization beam splitter 107G are fixed. In drawing 3 (a), although direct installation section 2013L is attached in the inferior surface of tongue of polarization beam splitter 107G, illustration of this part is omitted.

[0029] Any of optical adhesives, such as epoxy nature adhesives, silicon nature adhesives, and an ultraviolet curing mold, are sufficient as the adhesives to be used. In addition, when pasting up the direct installation sections 2013U and 2013L (un-illustrating) on the vertical side through which the light of polarization beam splitter 107G does not pass, it pastes up so that the polarization separation section PS concerned of polarization beam splitter 107G may not be straddled. In the example of drawing 3 (b), prism 107GA has pasted the 1st unification member 201 among prism 107GA which constitutes polarization beam splitter 107G, and prism 107GB. the stress accompanying the heat shrink which originates in hardening of Binder AD and the temperature change of the perimeter after hardening to the polarization separation section PS by making it Adhesives AD or the direct installation sections 2013U and 2013L not straddle the polarization separation section PS gives — not having — becoming — the polarization separation property of polarization beam splitter 107G — a bad influence — ***** — there are nothings.

[0030] Moreover, since through holes (opening) HU and HL (un-illustrating) are filled up with Adhesives AD and it fixes, it becomes easy to judge the excess and deficiency of the amount of the adhesives AD used. Furthermore, for the adhesives AD hardened by through holes HU and HL, stress is ***** (refer to drawing 3 (b)) to point symmetry to the core of opening by the heat shrink by the temperature change after hardening in the direction of the perimeter of opening. For this reason, stress cannot give stress easily to some directions to polarization beam splitter 107G compared with a ***** case.

[0031] In addition, the 1st unification member 201 carries out press sheet metal work for example, of the SUS410 plate member, and is formed. And before pasting up the 1st unification member 201 on polarization beam splitter 107G, solder plating is performed to the soldering installation sections 2011U and 2011L of this member.

[0032] Next, the quarter-wave length phase plate unification member 202 is explained. The quarter-wave length phase plate unification member 202 also has a frame configuration. That is, abbreviation rectangle-like H [opening 202] which pass the incident light of light valve 109G and the reflective injection light from light valve 109G are prepared in the center section. Rectangle-like G [quarter-wave length phase plate 108] are stuck from the 1st unification member 201 side so that these opening 202H may be closed.

[0033] The attaching parts 2021U and 2021L installed up and down, respectively are formed in the upper part of the quarter-wave length phase plate unification member 202, and a lower abbreviation center section. Attaching part 2021U is once bent at the 1st unification member 201 side, and is bent again at the upper part side of the quarter-wave length phase plate unification member 202. On the other hand, attaching part 2021L is once bent at the 1st unification member 201 side, and is bent again at the lower part side of the quarter-wave length phase plate unification member 202. These attaching parts 2021U and 2021L are inserted in the through hole sections 2012U and 2012L of the 1st unification member 201 later, respectively.

[0034] In one side of the right-and-left section of opening 202H, the circular holes 2022U and 2022L are further formed in the quarter-wave length phase plate unification member 202 as a through hole. The projection boss sections 2014U and 2014L of the 1st unification member 201 are inserted in these circular holes 2022U and 2022L later, respectively.

[0035] The quarter-wave length phase plate unification member 202 explained above is held at the 1st unification member 201 by inserting attaching part 2021L in through hole section 2012L of the 1st unification member 201

while it inserts in through hole section 2012U of the 1st unification member 201 attaching part 2021U mentioned above (temporary immobilization). This is because contact section 2021LT of attaching part 2021L is contacted by the radii section of through hole section 2012L according to the elastic force which attaching part 2021L has while contact section 2021UT of attaching part 2021U is contacted by the elastic force which attaching part 2021U has at the radii section of through hole section 2012U. At this time, the projection boss sections 2014U and 2014L of the 1st unification member 201 are inserted in the circular holes 2022U and 2022L of the quarter-wave length phase plate unification member 202, respectively.

[0036] The light valve unification member 203 is explained. Opening 203H of the shape of an abbreviation rectangle the light valve unification member 203 makes the center section pass the incident light of light valve 109G and the reflective injection light from light valve 109G are prepared. Reflective mold light valve 109G are attached in these opening 203H from the 1st unification member 201 and the opposite side.

[0037] It is installed in the opening 203H top of the light valve unification member 203, and the opening 203H bottom up and down, respectively, and the soldering installation sections 2031U and 2031L bent aslant at the 1st unification member 201 side are formed in them. The tip of the soldering installation sections 2031U and 2031L is bent so that it may become parallel to the 1st unification member 201, respectively. The tip of soldering installation section 2031U is soldered to soldering installation section 2011U of the 1st unification member 201. Moreover, the tip of soldering installation section 2031L is soldered to soldering installation section 2011L of the 1st unification member 201.

[0038] Here, spacing after installation of quarter-wave length phase plate 108G which the soldering installation sections 2031U and 2031L of the light valve unification member 203 mentioned above by being bent aslant at the 1st unification member 201 side; and reflective mold light valve 109G is made large. Consequently, quarter-wave length phase plate 108G are arranged near polarization beam splitter 107G from reflective mold light valve 109G between polarization beam splitter 107G and reflective mold light valve 109G.

[0039] Before carrying out soldering fixing of the light valve unification member 203 at the 1st unification member 201, adhesion fixing to polarization beam splitter 107G of the 1st unification member 201 mentioned above and temporary immobilization in the 1st unification member 201 of the quarter-wave length phase plate unification member 202 in which quarter-wave length phase plate 108G were attached are performed. Moreover, it carries out about the member for R light, and the member for B light as well as installation of each part material for G light. And the solder installation sections 2011U and 2011L of the 1st unification member 201 are made to carry out soldering fixing of the solder installation sections 2031U and 2031L of the light valve unification member 203 for G light, respectively.

[0040] After carrying out soldering fixing of the light valve unification member 203 for G light at the 1st unification member 201, the projection image by G light is made to project on a screen. criteria [image / by this G light / projection] — carrying out — the pixel location of light valve 109R for R light — the object for G light — an R ***** 1 unification member (un-illustrating) is made to carry out soldering fixing of the light valve unification member for R light (un-illustrating) so that it may be in agreement with the pixel location which is light valve 109G the same — carrying out — the pixel location of light valve 109B for B light — the object for G light — a B ***** 1 unification member (un-illustrating) is made to carry out soldering fixing of the light valve unification member for B light (un-illustrating) so that it may be in agreement with the pixel location which is light valve 109G. Thereby, in a projection image, the pixel of three colors of R light, G light, and B light can be made in agreement (registration is attained):

[0041] Next, location **** of a quarter-wave length phase plate is performed for every colored light. What is necessary is just to make it the direction of the phase leading shaft (lagging axis) of a quarter-wave length phase plate become perpendicularly or parallel to the space of drawing 1 in the chief ray concerning a polarization beam splitter theoretically, as mentioned above. However, the pre tilt concerning the deflection error of the phase leading shaft (lagging axis) resulting from the truncation error of a quarter-wave length phase plate, the installation error of a quarter-wave length phase plate, and the array of the liquid crystal molecule of the liquid crystal layer of a light valve to be used etc. cannot determine uniquely the shaft orientations of a quarter-wave length phase plate. So, with the gestalt of the first operation, a quarter-wave length phase plate is rotated around an optical axis, and location **** is performed so that the phase plate concerned may be made into the optimal location.

[0042] about a quarter-wave length phase plate carrying out location appearance, G light is mentioned as an example and explained. What is necessary is just to carry out like [light / R light and / B] the case of G light. As mentioned above, temporary immobilization of the quarter-wave length phase plate unification member 202 is carried out between the 1st unification member 201 by which adhesion fixing was carried out polarization beam splitter 107G, and the light valve unification member 203 by which soldering fixing was carried out at the 1st unification member 201. The quarter-wave length phase plate unification member 202 is held at the 1st unification member 201 according to the elastic force which the attaching parts 2021U and 2021L have. At this time, quarter-wave length phase plate 108G are almost inserted into opening 201H of the 1st unification member 201, approach the injection side (plane of incidence) of a polarization beam splitter 107, and are arranged.

[0043] The switching element of reflective mold light valve 109G is made into the condition in the condition of not choosing, i.e., an OFF state, corresponding to all pixels, and a black image is made to project on a screen, making temporary immobilization the quarter-wave length phase plate unification member 202. And imitate circular hole 2022U and 2022L, they are made to rotate the quarter-wave length phase plate unification member 202, and it fixes in the condition that a projection image becomes black most. The immobilization inserts adhesives between the point of the attaching parts 2021U and 2021L of the quarter-wave length phase plate unification member 202 which is sticking out to the polarization beam splitter 107G side through the through hole sections 2012U and 2012L of the 1st unification member 201, and the 1st unification member 201, and carries out adhesion fixing. Thus, quarter-wave length phase plate 108G are united with polarization beam splitter 107G by attaching the quarter-wave length phase plate unification member 202 in the 1st unification member 201.

[0044] According to the gestalt of the first operation explained above, the following operation effectiveness is acquired.

(1) Since it is not necessary to secure a paste allowance in the close outgoing radiation side of light into the part which approaches injection and the field which carries out incidence in the light of the vertical side through which the light of polarization beam splitter 107G does not pass compared with the case where adhesion fixing is carried out in the close outgoing radiation side of the light of polarization beam splitter 107G since it was made to carry out adhesion fixing of the 1st unification member 201, polarization beam splitter 107G can be made small. Effectiveness is acquired by a miniaturization and cost reduction of equipment as a result of being able to make an optical member small.

(2) Adhesion fixing with polarization beam splitter 107G and the 1st unification member 201 makes the vertical side of polarization beam splitter 107G put between the direct installation sections 2013U and 2013L, and perform it by making the through holes (opening) HU and HL prepared in the direct installation sections 2013U and 2013L, respectively fill up with and harden adhesives. It becomes easy to judge the excess and deficiency of the amount of the adhesives used by filling up through holes HU and HL with adhesives. Furthermore, for the adhesives hardened by through holes HU and HL, stress is ***** to homogeneity in the direction of the perimeter of a through hole by the heat shrink by the temperature change after hardening. Thereby, compared with a ***** case, stress [as opposed to polarization beam splitter 107G in stress] is reduced in some directions, and exfoliation of jointing and damage on polarization beam splitter 107G are prevented. Between polarization beam splitter 107G and the direct installation sections 2013U and 2013L, adhesives act just like lubricant, jointing is slippery further again compared with the case where a binder is applied, and a gap does not arise in physical relationship optical as a result.

(3) since it was made For Adhesives AD not to straddle the polarization separation section PS concerned which is polarization beam splitter 107G when pasting up polarization beam splitter 107G and the 1st unification member 201, the stress accompanying the heat shrink which originates in hardening of Binder AD and the temperature change after hardening to the polarization separation section PS gives — not having — becoming — the polarization separation property of polarization beam splitter 107G — a bad influence — ***** — there are nothings.

(4) It was made to unify polarization beam splitter 107G and reflective mold light valve 109G by carrying out soldering fixing of this light valve unification member 203 at the 1st unification member 201 of the above (1) and (2) by attaching reflective mold light valve 109G in the light valve unification member 203. Consequently, the cantilever unification of reflective mold light valve 109G can be carried out to polarization beam splitter 107G so that a gap may not arise in optical physical relationship.

(5) Quarter-wave length phase plate 108G are attached in the quarter-wave length phase plate unification member 202, and it was made to carry out temporary immobilization of this quarter-wave length phase plate unification member 202 at the 1st unification member 201 of the above (1) and (2). The quarter-wave length phase plate unification member 202 is held at the 1st unification member 201 according to the elastic force which the attaching parts 2021U and 2021L have. Furthermore, since it was made pivotable to the optical axis at the time of temporary immobilization, the wavelength phase plate unification member 202 can be rotated around an optical axis, and location **** of quarter-wave length phase plate 108G can be performed so that the optimal contrast may be acquired. Consequently, adjustment becomes easy and an adjustment man day is reduced.

(6) Quarter-wave length phase plate 108G are almost inserted into opening 201H of the 1st unification member 201, approach the injection side (plane of incidence) of a polarization beam splitter 107, and were arranged. Quarter-wave length phase plate 108G are arranged near polarization beam splitter 107G rather than reflective mold light valve 109G. Consequently, since it is distant from the image surface (reflective mold light valve 109G) even when foreign matters, such as dust, adhere to quarter-wave length phase plate 108G and being clearly projected upwards on a foreign matter by the screen is prevented, displeasure is not given to those who are looking. Moreover, since it is not clearly projected upwards on the black unevenness by the local engine-performance omission produced in the manufacture process by the screen when quarter-wave length phase plate 108G are formed by plastic film material, such as a polycarbonate, displeasure is not given to those who are looking. Furthermore, light valve 109G are accidentally touched in the case of location **** of quarter-wave length phase plate 108G, and optical physical relationship is not made to produce a gap by having detached quarter-wave length phase plate 108G and light valve 109G.

[0045] - Gestalt- drawing 4 of the second operation is the basic block diagram of the projection mold display by the gestalt of operation of the second of this invention. drawing 4 — setting — a projection mold indicating equipment — the light source 301, a polarization beam splitter 302, the 1st prism 303, the 2nd prism 304, the 3rd prism 305, quarter-wave length phase plate 306B, quarter-wave length phase plate 306R, quarter-wave length phase plate 306G, reflective mold light valve 307B for B light, reflective mold light valve 307R for R light, and the object for G light — it has reflective mold light valve 307G, a projector lens 308, and the field lens 309.

[0046] The light source 301 consists of lamp 301a and concave mirror 301b of a paraboloid configuration. Incidence of the light source light of the abbreviation parallel flux of light injected from the light source 301 is carried out to a polarization beam splitter 302 through the field lens 309. A polarization beam splitter 302 has the polarization separation section, and carries out polarization separation at S polarization reflected by the polarization separation section and P polarization which penetrates the polarization separation section. Among these, S polarization is discarded as an unnecessary light.

[0047] Incidence of the P polarization by which transparency injection was carried out is carried out from field 303a of the 1st prism 303 in a polarization beam splitter 302. The light which carried out incidence from field 303a of prism 303 advances the inside of the 1st prism 303 as it is; B light is reflected by the die clo IKKU film formed in field 303b, and R light and G light are penetrated with it. The die clo IKKU film currently formed in field 303b reflects B light, and it has the property which penetrates R light and G light. B light reflected by the die clo IKKU film of field 303b advances the inside of the 1st prism 303, and receives a total reflection operation in field 303a of the 1st prism 303. B light by which total reflection was carried out advances the inside of the 1st prism 303 further, and is injected from field 303c of the 1st prism 303. Incidence of R light and G light which penetrated the die clo IKKU film of field 303b of the 1st prism 303, and were injected from the 1st prism 303 on the other hand is carried out to the 2nd prism 304 from field 304a.

[0048] The 1st prism 303 and the 2nd prism 304 separate an opening, and fixing unification is carried out. On both sides of the die clo IKKU film, the adhesion unification of the 2nd prism 304 and the 3rd prism 305 is carried out between field 304b of the 2nd prism 304, and field 305a of the 3rd prism 305. The die clo IKKU film between the 2nd prism 304 and the 3rd prism 305 reflects R light, and it has the property which penetrates G light.

[0049] A mixed light of R light and G light by which incidence was carried out to the 2nd prism 304 from field 304a advances the inside of the 2nd prism 304 as it is, R light is reflected by the die clo IKKU film formed in field 304b, and G light is penetrated. Reflected R light advances the inside of the 2nd prism 304, and receives a total reflection operation in field 304a of the 2nd prism 304. R light by which total reflection was carried out advances the inside of the 2nd prism 304, and is injected from field 304c of the 2nd prism 304. Incidence of the G light

which penetrated the die clo IKKU film of field 304b of the 2nd prism 304, and was injected from the 2nd prism 304 on the other hand is carried out to the 3rd prism 305 from field 305a. G light advances the inside of the 3rd prism 305, and receives a total reflection operation in field 305b of the 3rd prism 305. G light by which total reflection was carried out advances the inside of the 3rd prism 305, and is injected from field 305c of the 3rd prism 305.

[0050] Incidence of the B light injected from field 303c of the 1st prism 303 is carried out to reflective mold light valve 307B for B light as illumination light through quarter-wave length phase plate 306B arranged near the injection side 303c of the 1st prism 303. R light injected from field 304c of the 2nd prism 304 and G light injected from field 305c of the 3rd prism 305 like B light pass quarter-wave length phase plate 306R arranged near the injection side of each prism, respectively, and quarter-wave length phase plate 306G — reflective mold light valve 307 for R light R, and the object for G light — incidence is carried out to reflective mold light valve 307G as illumination light, respectively. Each reflective mold light valve for colors is the same as that of what was used with the gestalt of the first operation, and the explanation is omitted.

[0051] B light which carried out reflective injection of the reflective mold light valve 307B for B light advances an incident light shaft to hard flow, and incidence is carried out to the 1st prism 303 from field 303c of the 1st prism 303, and it is injected from field 303a of the 1st prism 303. B light — the same — reflective mold light valve 307 for R light R, and the object for G light — R light and G light which carried out reflective injection of reflective mold light valve 307G advance an incident light shaft to hard flow, respectively. After incidence of the R light is carried out to the 2nd prism 304 from field 304c of the 2nd prism 304 and incidence is carried out to the 1st prism 303; it is injected from field 303a of the 1st prism 303. Moreover, after incidence of the G light is carried out to the 3rd prism 305 from field 305c of the 3rd prism 305 and incidence is carried out to the 1st prism 303 through the 2nd prism 304, it is injected from field 303a of the 1st prism 303. That is, from field 303a of the 1st prism 303, the color composition light of B light, R light, and G light is injected. Incidence of the injected color composition light is carried out to a polarization beam splitter 302 from field 302a, modulation light (S polarization) is carried out as the reflected light, and polarization separation (light analysis) of the light (P polarization) non-becoming irregular is carried out by the polarization separation section as the transmitted light. Among these, outgoing radiation of the S polarization is carried out from field 302b of a polarization beam splitter 302, and incidence is carried out to a projector lens 308, and it is projected by the non-illustrated screen as a full color image. On the other hand, P polarization is discarded as an unnecessary light. In addition, the 1st prism 303, the 2nd prism 304, and the 3rd prism 305 constitute color-separation composition compound prism.

[0052] The quarter-wave length phase plates 306B, 306R, and 306G have the function which raises the contrast of the projection image on a screen like the gestalt of the first operation. The quarter-wave length phase plates 306B, 306R, and 306G may be wavelength phase plates of different wavelength from quarter-wave length. This reason is because it is possible to control a polarization condition by the die clo IKKU film mentioned above and the total reflection film of each prism besides the reason described by explanation of the gestalt of the first operation.

[0053] The field lens 309 is arranged for the purpose of the chief ray determined by the aperture diaphragm which is not illustrated in a projector lens 308 becoming parallel to an optical axis between the field lenses 309 and projector lenses 308 concerned like the field lens of the gestalt of the first operation. Although three field lenses were arranged for every colored light with the gestalt of the first operation, it is one piece with this operation gestalt. the field lens 309 — a polarization beam splitter 302, the color-separation composition compound prism 303, 304, and 305, the quarter-wave length phase plates 306B, 306R, and 306G, the reflective mold light valves 307B and 307R, and the optical path of 307G — setting — a tele cent with a chief ray parallel to an optical axis — it becomes a rucksack configuration.

[0054] Drawing 5 is a decomposition block diagram explaining installation of the color-separation composition compound prism of the projection mold indicating equipment of drawing 4, a quarter-wave length phase plate, and a light valve. In drawing 5, the same sign is described in the same unification member as drawing 4 and drawing 2 by the gestalt of the first operation. Although the object for B colors, the object for R colors and the quarter-wave length plate for G colors, the object for B colors and the object for R colors, and the reflective mold light valve for G colors are attached in color-separation composition prism, respectively, the mounting arrangement is the same also as each color. Then, installation of quarter-wave length phase plate 306B to the 1st prism 303 and

reflective mold light valve 307B is mentioned as an example, and is explained, and the illustration about installation of R color and each part material for G colors and explanation are omitted.

[0055] The structure of the 1st unification member 201, the quarter-wave length phase plate unification member 202, and the light valve unification member 203 is the same as the gestalt of the first operation. With the gestalt of the second operation, the points which carry out adhesion fixing of the 1st unification member 201 at the 1st prism 303 differ. That is, the part close to the optical ON outgoing radiation side of the vertical side through which the light of the 1st prism 303 does not pass is made to put between the direct installation sections 2013U and 2013L of the 1st unification member 201. Through holes (opening) HU and HL are made to fill up with and harden adhesives in this condition, and the 1st unification member 201 and the 1st prism 303 are fixed.

[0056] Since the installation procedure of the quarter-wave length phase plate unification member 202 and the light valve unification member 203 is the same as that of the gestalt of the first operation, explanation is omitted. Moreover, it carries out like [adjustment / (pixel doubling) / each light valve / registration] the gestalt of the first operation. furthermore, a quarter-wave length phase plate carries out location appearance, and fixing also rotates the quarter-wave length phase plate unification member 202, and is performed to the surroundings of an optical axis. [as well as the gestalt of the first operation]

[0057] According to the gestalt of the second operation explained above, the same operation effectiveness as the gestalt of the first operation can be acquired.

[0058] - Gestalt- drawing 6 of the third operation is the basic block diagram of the projection mold display by the gestalt of operation of the third of this invention. In drawing 6 a projection mold display The light source 401 and the polarization lighting system 402; The wavelength selection nature phase plate 403; a polarization beam splitter 404, and a polarization beam splitter 405, A polarization beam splitter 406, a polarization beam splitter 407, and the wavelength selection nature phase plate 408, The wavelength selection nature phase plate 409, the 1/2-wave phase plate 410, and the wavelength selection nature phase plate 411, Quarter-wave length phase plate 412B, quarter-wave length phase plate 412R, and quarter-wave length phase plate 412G, reflective mold light valve 413B for B light, reflective mold light valve 413R for R light, and the object for G light — it has reflective mold light valve 413G, a projector lens 414, and the field lens 415.

[0059] The light source 401 consists of lamp 401a and concave mirror 401b of a paraboloid configuration. The light source flux of light injected from the light source 401 is changed into abbreviation single polarization (P polarization) by the polarization lighting system 402. This polarization lighting system 402 consists of the fly eye integrator, a polarization beam splitter array, a 1/2-wave phase plate, and a condensing lens. A fly eye integrator consists of the 1st lens plate which arranged two or more lenses superficially, and the 2nd same lens plate. Two or more polarization beam splitters were formed in the shape of an array, and a polarization beam splitter array is arranged in the injection side of a fly eye integrator. A 1/2-wave phase plate is arranged in the injection side of the predetermined polarization beam of a polarization beam splitter array. A condensing lens condenses the single polarization injected from the above-mentioned polarization beam splitter array and the above-mentioned 1/2-wave phase plate. By these configurations, the light source light by the light source 401 is changed into single polarization (this operation gestalt P polarization).

[0060] Incidence of the single polarization injected from the polarization lighting system 402 is carried out to the wavelength selection nature phase plate 403 through the field lens 415. The wavelength selection nature phase plate 403 changes and injects only the component of G light wave length field to S polarization from which the oscillating direction differs among P polarization by which incidence was carried out, and injects the component of R light wave length field and B light wave length field with P polarization. Here, the wavelength selection nature phase plate 403 and the wavelength selection nature phase plate 408,409,411 mentioned later have the function to change and inject only a specific wavelength region to polarization of the different oscillating direction from incidence polarization among the single polarization by which incidence is carried out, and is indicated by a U.S. Pat. No. 5751384 number, No. 5990996, No. 5999240, etc.

[0061] The duty of the field lens 415 is to make it the chief ray determined by the aperture diaphragm of a projector lens 414 become parallel to an optical axis like the first and second operation gestalten in the optical path between the field lenses 415 and projector lenses 414 concerned.

[0062] Incidence of the light which injected the wavelength selection nature phase plate 403 is carried out to a polarization beam splitter 404. A polarization beam splitter 404 has the polarization separation section, and carries

out polarization separation at S polarization reflected by the polarization separation section and P polarization which penetrates the polarization separation section. Thereby, the color of the incident light of a polarization beam splitter 404 is separated into R light and a mixed light of B light which are P polarization, and G light which is S polarization. Incidence of the G light whose color was separated is carried out to the adjoining polarization beam splitter 405, and reflective injection is carried out by the polarization separation section of the polarization beam splitter 405 concerned. G light injected from the polarization beam splitter 405 should pass quarter-wave length phase plate 412G arranged near the injection side -- the object for G light -- incidence is carried out to reflective mold light valve 413G as illumination light. The reflective mold light valve used with the gestalt of the third operation is the same as that of what was used with the gestalt of the first and the second operation, and the explanation is omitted.

[0063] Incidence of the mixed light of R light by which transparency injection was carried out, and B light is carried out to the wavelength selection nature phase plate 408 arranged near the injection side of a polarization beam splitter 404 in a polarization beam splitter 404. The wavelength selection nature phase plate 408 changes and injects only the component of B light wave length field to S polarization from which the oscillating direction differs among P polarization by which incidence was carried out, and injects the component of R light wave length field with P polarization. Incidence of the light which injected the wavelength selection nature phase plate 408 is carried out to a polarization beam splitter 406. The color of the incident light of a polarization beam splitter 406 is separated into R light which is P polarization, and B light which is S polarization. R light whose color was separated, and B light are injected from the injection side where polarization beam splitters 406 differ, respectively, and incidence is carried out to the reflective mold light valves 413R and 413B as illumination light through the quarter-wave length phase plates 412R and 412B arranged near the injection side, respectively. Thus, a polarization beam splitter 404 and a polarization beam splitter 406 constitute color-separation optical system.

[0064] Incidence of the B colored light which carried out reflective injection of the light valve 413B for B colored light is again carried out to a polarization beam splitter 406 through quarter-wave length phase plate 412B, and polarization separation (light analysis) is carried out to the modulation light of P polarization which penetrates the polarization separation section, and a light of S polarization which reflects the polarization separation section non-becoming irregular. A light reflected by the polarization beam splitter 406 non-becoming irregular advances in the light source 401 direction, and is discarded. Similarly, incidence of the R colored light which carried out reflective injection of the light valve 413R for R colored light is again carried out to a polarization beam splitter 406 through quarter-wave length phase plate 412R, and polarization separation (light analysis) is carried out to the modulation light of S polarization which reflects the polarization separation section; and a light of P polarization which penetrates the polarization separation section non-becoming irregular. A light which penetrates a polarization beam splitter 406 non-becoming irregular advances in the light source 401 direction, and is discarded.

[0065] Incidence of the analyzing light of R light which had the polarization beam splitter 406 injected, and B light is carried out to the wavelength selection nature phase plate 411 arranged near the injection side of a polarization beam splitter 406. The wavelength selection nature phase plate 411 changes and injects only the component of R light wave length field to P polarization from which the oscillating direction differs among S polarization by which incidence was carried out, and injects the component of B light wave length field with P polarization. Incidence of the light which injected the wavelength selection nature phase plate 411 is carried out to a polarization beam splitter 407.

[0066] On the other hand, incidence of the G colored light which carried out reflective injection of light valve 413G for G colored light is again carried out to a polarization beam splitter 405 through quarter-wave length phase plate 412G, and polarization separation (light analysis) is carried out to the modulation light of P polarization which penetrates the polarization separation section, and a light of S polarization which reflects the polarization separation section non-becoming irregular. A light reflected by the polarization beam splitter 405 non-becoming irregular advances in the light source 401 direction, and is discarded.

[0067] Incidence of the analyzing light of G light which had the polarization beam splitter 405 injected is carried out to the 1/2-wave phase plate 410 arranged near the injection side of a polarization beam splitter 405. The 1/2-wave phase plate 410 changes P polarization by which incidence was carried out into S polarization from which the oscillating direction differs, and is injected. Incidence of the light which injected the 1/2-wave phase

plate 410 is carried out to a polarization beam splitter 407.

[0068] A polarization beam splitter 407 penetrates the modulation light of B light which is P polarization by which incidence is carried out from the drawing 6 bottom, and R light, reflects the modulation light of G light which is S polarization by which incidence is carried out from the right-hand side of drawing 6 in the polarization separation section, and injects it to the drawing 6 bottom. Near the injection side of a polarization beam splitter 407, the wavelength selection nature phase plate 409 is arranged. Among incident light, the wavelength selection nature phase plate 409 changes only the component of G light wave length field into the polarization from which the oscillating direction differs, and is injected. By passing through the wavelength selection nature phase plate 409, incidence of the modulation light of all wavelength regions is carried out to a projector lens 414 as P polarization, and it is projected on a full color image on a non-illustrated screen. As mentioned above, a polarization beam splitter 406 performs color composition of the modulation light of R light and B light. Moreover, a polarization beam splitter 407 performs color composition with the color composition light of R light and B light, and the modulation light of G light. Thus, a polarization beam splitter 406 and a polarization beam splitter 407 constitute color composition optical system.

[0069] Drawing 7 is a decomposition block diagram explaining installation of the polarization beam splitter of the projection mold indicating equipment of drawing 6, a quarter-wave length phase plate, and a light valve. In drawing 7, the same sign is described in the same unification member as drawing 2 by the gestalt of drawing 6, the first, and the second operation, and drawing 5. a polarization beam splitter 405 — the object for G colors — quarter-wave length plate 412G and the object for G colors — reflective mold light valve 413G are attached. Quarter-wave length plate 412B for B colors; reflective mold light valve 413for B colors B, and quarter-wave length plate 412R for R colors and reflective mold light valve 413R for R colors are attached in a polarization beam splitter 406, respectively. Since the mounting arrangement of these each part material is the same also as each color, installation of quarter-wave length phase plate 412B to a polarization beam splitter 406 and reflective mold light valve 413B is mentioned as an example, and is explained, and the illustration about installation of R color and each part material for G colors and explanation are omitted.

[0070] The structure of the 1st unification member 201, the quarter-wave length phase plate unification member 202, and the light valve unification member 203 is the same as the gestalt of the first mentioned above and the second operation. With the gestalt of the third operation, the points which carry out adhesion fixing of the 1st unification member 201 at a polarization beam splitter 406 differ. That is, the part close to the optical ON outgoing radiation side of the vertical side through which the light of a polarization beam splitter 406 does not pass is made to put between the direct installation sections 2013U and 2013L of the 1st unification member 201. Through holes (opening) HU and HL are made to fill up with and harden adhesives in this condition, and the 1st unification member 201 and a polarization beam splitter 406 are fixed. In addition, when pasting up the direct installation sections 2013U and 2013L on the vertical side through which the light of a polarization beam splitter 406 does not pass, it pastes up so that the polarization separation section PS of the polarization beam splitter 406 concerned may not be straddled. In the example of drawing 7, prism 406A pastes the 1st unification member 201 among prism 406A which constitutes a polarization beam splitter 406, and prism 406B. the stress accompanying the heat shrink which originates in hardening of a binder and the temperature change after hardening to the polarization separation section PS by making it adhesives or the direct installation sections 2013U and 2013L not straddle the polarization separation section PS gives — not having — becoming — the polarization separation property of a polarization beam splitter 406 — a bad influence — ***** — there are nothings.

[0071] Since the installation procedure of the quarter-wave length phase plate unification member 202 and the light valve unification member 203 is the same as that of the gestalt of the first operation, explanation is omitted. Moreover, it carries out like [adjustment / (pixel doubling) / each light valve / registration] the gestalt of the first operation. furthermore, a quarter-wave length phase plate carries out location appearance, and fixing also rotates the quarter-wave length phase plate unification member 202, and is performed to the surroundings of an optical axis. [as well as the gestalt of the first operation]

[0072] According to the gestalt of the third operation explained above, the same operation effectiveness as the gestalt of the first and the second operation is acquired.

[0073] When [at which it explained above] pasting up the 1st unification member 201 and each optical member,

adhesives are filled up with the gestalt of the third operation into the through holes (opening) HU and HL (un-illustrating) of the direct installation sections 2013U and 2013L of the 1st unification member 201, and it was made to paste them with it from the gestalt of the first operation. Adhesives may be applied to the perimeter around the openings HU and HL of the direct installation sections 2013U and 2013L, and, instead, you may paste up. For example, adhesives will be absorbed by the clearance between the direct installation sections 2013U and 2013L and each optical member (perimeter around Openings HU and HL) if the viscosity before hardening fills up Openings HU and HL with adhesives using low adhesives (refer to drawing 3 (c)). That is, it is between the direct installation sections 2013U and 2013L and polarization beam splitter 107G, and adhesives enter into the adhesives spreading section of the through holes HU and HL surrounded with a broken line. At this time, adhesives do not accumulate in Openings HU and HL, but adhesion fixing as well as the case where apply adhesives to the perimeter around Openings HU and HL, and it is pasted is carried out. Also in this case, the same operation effectiveness as the case (refer to drawing 3 (b)) where stress fills up adhesives with that of ***** and pastes homogeneity in the through hole opening HU and HL by it in the direction of the perimeter of opening is acquired by the heat shrink by the temperature change after hardening. In addition, it is the periphery of the through holes HU and HL of the direct installation sections 2013U and 2013L shown by drawing 3 (c), and adhesives may be applied by applying direct adhesives to the adhesives spreading section surrounded with a broken line.

[0074] Moreover, although the used light valve was a reflective mold light valve in the above explanation, it is also possible to apply this invention to the projection mold display of a configuration of to have used the transparency mold light valve. In this case, for each [the color of was separated] color of every, a polarizing plate is arranged, respectively and these polarizing plates form polarization separation optical system and an analyzing light study system in an incidence [of a transparency mold light valve], and injection side. Incidence of the analyzing light of the predetermined polarization which injected the light valve is carried out to a projector lens through color composition optical system.

[0075] Correspondence with each component in a claim and each component in the gestalt of implementation of the first of invention is explained. A projector lens 112 corresponds to an incident light study system. Polarization beam splitter 107G (107R) (107B) correspond to a light valve installation optical member, polarization separation optical system, and an analyzing light study system. The 1st unification member 201 is equivalent to a fixing member. The bending sections 2013U (upper part) and 2013L (lower part) correspond to jointing. Through holes HU and HL are equivalent to opening. Prism 107GA corresponds to the 1st prism. Prism 107GB corresponds to the 2nd prism. The polarization separation section PS corresponds to a polarization demarcation membrane.

[0076] Correspondence with each component in a claim and each component in the gestalt of implementation of the second of invention is explained. A projector lens 308 corresponds to an incident light study system. The 1st prism 303 (the 2nd prism 304) (the 3rd prism 305) corresponds to a light valve installation optical member. A polarization beam splitter 302 corresponds to polarization separation optical system and an analyzing light study system. The 1st unification member 201 is equivalent to a fixing member. The bending sections 2013U (upper part) and 2013L (lower part) correspond to jointing. Through holes HU and HL are equivalent to opening. The 1st prism 303, the 2nd prism 304, and the 3rd prism 305 correspond to color-separation optical system and color composition optical system.

[0077] Correspondence with each component in a claim and each component in the gestalt of implementation of the third of invention is explained. A projector lens 414 corresponds to an incident light study system. Polarization beam splitters 405 and 406 correspond to a light valve installation optical member, polarization separation optical system, and an analyzing light study system. Polarization beam splitters 404 and 406 correspond to color-separation optical system. Polarization beam splitters 406 and 407 correspond to color composition optical system. The 1st unification member 201 is equivalent to a fixing member. The bending sections 2013U (upper part) and 2013L (lower part) correspond to jointing. Through holes HU and HL are equivalent to opening. Prism 406A corresponds to the 1st prism. Prism 406B corresponds to the 2nd prism. The polarization separation section PS corresponds to a polarization demarcation membrane.

[0078]

[Effect of the Invention] According to this invention, the following effectiveness is done so as explained to the detail above. That is, in claim 1, claim 7, and invention according to claim 13 to 16, when a heat shrink arises in

adhesives by the temperature change after adhesion, stress does not incline toward one side. Consequently, compared with a ***** case, stress [as opposed to an optical member in stress] is reduced in some directions, and exfoliation of jointing and damage on an optical member are prevented.

[Translation done.]

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
 2. ***** shows the word which can not be translated.
 3. In the drawings, any words are not translated.
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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the basic block diagram of the projection mold display by the gestalt of the first operation.

[Drawing 2] It is a decomposition block diagram explaining installation of the polarization beam splitter of the projection mold indicating equipment of drawing 1, a quarter-wave length phase plate, and a light valve.

[Drawing 3] (a) It is the enlarged drawing of jointing in the case of being with the enlarged drawing of jointing in the case of pasting up with the adhesives in the perspective view showing signs that the 1st unification member is attached, and (b) opening, and the adhesives of the perimeter of (c) opening, and pasting a polarization beam splitter.

[Drawing 4] It is the basic block diagram of the projection mold display by the gestalt of the second operation.

[Drawing 5] It is a decomposition block diagram explaining installation of the color-separation composition prism of the projection mold indicating equipment of drawing 4, a quarter-wave length phase plate, and a light valve.

[Drawing 6] It is the basic block diagram of the projection mold display by the gestalt of the third operation.

[Drawing 7] It is a decomposition block diagram explaining installation of the polarization beam splitter of the projection mold indicating equipment of drawing 6, a quarter-wave length phase plate, and a light valve.

[Description of Notations]

101, 301, 401 — Light source, 102 — A cross dichroic mirror, 103, 104 — Bending mirror, 105 — A dichroic mirror, 107R, 107G, 107B, 302, 404, 405, 406, 407 — Polarization beam splitter, 108R, 108G, 108B, 306B, 306G, 306R, 412B, 412G, 412R — Quarter-wave length phase plate, 109R, 109G, 109B, 307B, 307G, 307R, 413B, 413G, 413R [— The 1st unification member,] — A reflective mold light valve, 111 — A cross dichroic prism, 112, 308, 414 — A projector lens, 201 202 — A quarter-wave length phase plate unification member, 203 — Light valve unification member, [305 / — A wavelength selection nature phase plate, 410 / — 1/2 wave phase plate / — The 3rd prism, 402 — A polarization inverter, 403, 408, 409, 411] 303 — The 1st prism, 304 — The 2nd prism

[Translation done.]